

## GEPHE SUMMARY

**Gephebase Gene**  
BMP15

**Entry Status**  
Published

**GepheID**  
GP00002157

**Main curator**  
Martin

## PHENOTYPIC CHANGE

**Trait Category**  
Physiology

**Trait**  
Fertility (increased ovulation rate)

**Trait State in Taxon A**  
Ovis aries

**Trait State in Taxon B**  
Ovis aries - Belclare - High fertility in heterozygotes

**Ancestral State**  
Taxon A

**Taxonomic Status**  
Domesticated

### Taxon A

**Latin Name**  
*Ovis aries*

**Common Name**  
sheep

**Synonyms**  
Ovis ammon aries; Ovis orientalis aries; Ovis ovis; sheep; domestic sheep; lambs; wild sheep;  
Ovis aries Linnaeus, 1758

**Rank**  
species

**Lineage**  
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia;  
Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii;  
Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria;  
Laurasiatheria; Artiodactyla; Ruminantia; Pecora; Bovidae; Caprinae; Ovis

**Parent**  
Ovis () - (Rank: genus)

**NCBI Taxonomy ID**  
9940

**is Taxon A an Intraspecies?**  
No

### Taxon B

**Latin Name**  
*Ovis aries*

**Common Name**  
sheep

**Synonyms**  
Ovis ammon aries; Ovis orientalis aries; Ovis ovis; sheep; domestic sheep; lambs; wild sheep;  
Ovis aries Linnaeus, 1758

**Rank**  
species

**Lineage**  
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia;  
Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii;  
Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria;  
Laurasiatheria; Artiodactyla; Ruminantia; Pecora; Bovidae; Caprinae; Ovis

**Parent**  
Ovis () - (Rank: genus)

**NCBI Taxonomy ID**  
9940

**is Taxon B an Intraspecies?**  
Yes

**Taxon B Description**  
Ovis aries - Belclare ; Irish Cambridge

## GENOTYPIC CHANGE

**Generic Gene Name**  
Bmp15

**Synonyms**  
Bmp-15; C86824; C87336; GDF-9B; AU015375; AU018861; AU021453; Gdf9b

**String**  
10090.ENSMUSP00000024049

**Sequence Similarities**  
Belongs to the TGF-beta family.

**GO - Molecular Function**  
GO:0005125 : cytokine activity  
GO:0008083 : growth factor activity  
GO:0005160 : transforming growth factor beta receptor binding

**GO - Biological Process**  
GO:0045893 : positive regulation of transcription, DNA-templated  
GO:0001541 : ovarian follicle development  
GO:0030509 : BMP signaling pathway

**UniProtKB Mus musculus**  
Q9Z0L4

**GenebankID or UniProtKB**  
AHB23439

GO:0048468 : cell development  
GO:0060016 : granulosa cell development  
GO:0010862 : positive regulation of pathway-restricted SMAD protein phosphorylation  
GO:0042981 : regulation of apoptotic process  
GO:0043408 : regulation of MAPK cascade  
GO:0060395 : SMAD protein signal transduction

**GO - Cellular Component**

GO:0005737 : cytoplasm  
GO:0005615 : extracellular space

**Presumptive Null**

No

**Molecular Type**

Coding

**Aberration Type**

SNP

**SNP Coding Change**

Nonsynonymous

**Molecular Details of the Mutation**

c.1100G>T p.S367I

**Experimental Evidence**

Candidate Gene

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ser	Ile	367

**Main Reference**

Mutations in the genes for oocyte-derived growth factors GDF9 and BMP15 are associated with both increased ovulation rate and sterility in Cambridge and Belclare sheep (*Ovis aries*). (2004)

**Authors**

Hanrahan JP; Gregan SM; Mulsant P; Mullen M; Davis GH; Powell R; Galloway SM

**Abstract**

Belclare and Cambridge are prolific sheep breeds, the origins of which involved selecting ewes with exceptionally high litter size records from commercial flocks. The variation in ovulation rate in both breeds is consistent with segregation of a gene (or genes) with a large effect on this trait. Sterile ewes, due to a failure of normal ovarian follicle development, occur in both breeds. New naturally occurring mutations in genes for the oocyte-derived growth factors growth differentiation factor 9 (GDF9) and bone morphogenetic protein 15 (BMP15) are described. These mutations are associated with increased ovulation rate in heterozygous carriers and sterility in homozygous carriers in both breeds. This is the first time that a mutation in the gene for GDF9 has been found that causes increased ovulation rate and infertility in a manner similar to inactivating mutations in BMP15, and shows that GDF9 is essential for normal folliculogenesis in sheep. Furthermore, it is shown, for the first time in any species, that individuals with mutations in both GDF9 and BMP15 have a greater ovulation rate than sheep with either of the mutations separately.

**Additional References**

**RELATED GEPHE**

**Related Genes**

3 (B4GALNT2, BMP receptor IB (BMPRI3), GDF9)

**Related Haplotypes**

9

**EXTERNAL LINKS**

**COMMENTS**

Heterozygote shows phenotype; homozygote results in ovarian failure ; @HeterozygoteAdvantage @SexualTrait <https://omia.org/OMIA001719/9940/>

